there is probably none which is more favorably known than Weber's "Lehrbuch der Algebra" in three large volumes. The great extent of the work doubtless discouraged many beginners as well as those who have only time to learn the fundamental principles of this vast subject. Hence the small volume before us should find a hearty welcome among many students of mathematics who understand the German language.

The present book begins with a study of the elementary properties of determinants and their applications in the solution of a system of linear equations. The remaining fourteen chapters bear the following headings, in order: Numbers and integral functions, symmetric functions, roots, cubic and biquadratic equations, Sturm's theorem, approximation of the roots, groups, the Galois theory, cyclic equations, divisions of the circle, solution of the cyclotomic equation, algebraic solution of equations, numbers and functions of an algebraic realm, applications to cyclic realms.

From these chapter headings it is evident that the book under review is not confined to the most elementary matters, which can be found in nearly all the text-books on this subject. On the other hand, it does not presuppose very much, but develops from the beginning most of the subjects which it treats. As the book is a final effort, on the part of a great scholar and excellent writer, to present the main subjects of advanced algebra, it has a peculiar interest, both as regards the choice of material and the methods of treatment.

Although most students who are in position to profit much by the study of such a work can read German, yet there is doubtless a considerable number to whom an English translation would be very helpful, since there is no algebra in the English language which covers the same ground. The excellent "Introduction to Modern Algebra," by Professor Bôcher, for instance, does not enter into the Galois theory of equations and the theory of algebraic numbers—theories which occupy a prominent place in the present work.

In the preface it is stated that the author was assisted by his colleagues, especially by Messrs. Löwy, Epstein and Levi, while correcting the proof. These names, together with that of H. Weber, are a sufficient guarantee that no important errors appear in the book. Among the minor errors the statement that Dedekind first divided a group into double co-sets, which appears as a foot-note on page 196, is of especial interest. It is well known that Frobenius developed this method extensively in an article which appeared in *Crelle's Journal* in 1887, while Dedekind's article appeared seven years later.

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Measures of Proper Motion Stars Made with the 40-inch Refractor of the Yerkes Observatory in the Years 1907 to 1912. By S. W. BURNHAM. Washington, D. C. Published by the Carnegie Institution of Washington. 1913.

This handsome volume of iv + 311 quarto pages is so fully described by its title, given above, that comment upon it may be brief. To the astronomers of old time the stars were "fixed," *i. e.*, abiding eternally in the same celestial place without any trace of motion relative to their fellows. Less than two centuries ago, it was found that a few of the brighter stars appeared to be exceptional in this respect. Since increasing refinement of observation indicated a slow but continuous progression across the sky, peculiar or "proper" to a few stars that were forthwith assumed to be nearer than the others. The search for and determination of these proper motions has been one of the standard problems of astronomy since the time of Halley and the present volume is a contribution to that end. Its fundamental idea is that perceptible motion, being an unusual stellar attribute, may be assumed limited to the brighter stars and may be determined by measuring the change in the position of these exceptional stars by reference to any of the fainter ones about them. Possibly some suspicions with regard to the assumed fixity of the fainter stars finds expression in the author's introductory words, "It goes without

saying that every star in the heavens . . . must have some proper motion," but nevertheless he stoutly insists that for most stars this motion is of negligible amount, because the contrary has not yet been proved.

While the logic thus employed seems somewhat dubious, its quality need not be here too closely scanned. The present state of knowledge concerning stellar proper motions may be described as occupying intermediate ground between the fixity of the faint stars assumed by Burnham and his alternative proposition quoted above, which may be paraphrased into: Every star in the heavens does possess a sensible proper motion. The reviewer will undertake to show elsewhere that, at least down to the thirteenth magnitude, the latter proposition is more nearly true than is Burnham's assumption of fixity for the faint stars. If such be the case, the proper motions derived in this volume can command but little credence; they are quite futile, and the chief value of the work must be sought not in the fulfilment of its professed purposes, but in the furnishing of data from which the motions of the fainter stars may hereafter be derived when those of the brighter stars have been otherwise determined.

The as yet unborn investigator of stellar motions will find in this volume a rich store of material that he must use and will use for this purpose, albeit with writhings of spirit at the scanty information vouchsafed concerning its details, viz.: "These observations have been made in the usual way, fully described heretofore." The reviewer has not been able to find this description. He is left in doubt as to whether "the usual way" refers to observations of close double stars, such as have constituted the bulk of the author's previous work, or whether it implies that those modifications of program have been introduced that are required by the much greater angular distances between the stars here observed. How and with what precision was the parallel determined? How has the small, but troublesome, influence of refraction been dealt with? etc. These are questions that necessarily arise here, although of little consequence in ordinary double-star work. They find no answer in the text and, being unanswered, they must diminish the influence of the work and detract from the credence presumably due to its intrinsic character.

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SCIENTIFIC JOURNALS AND ARTICLES

The articles in the *American Journal of Science* for October are:

"Distribution of the Active Deposit of Radium in an Electric Field (II.)," E. M. Wellisch.

"Adjustment of the Quartz Spectrograph," C. C. Hutchins.

"Stability Relations of the Silica Minerals," C. N. Fenner.

"Custerite: A New Contact Metamorphic Mineral," J. B. Umpleby, W. T. Schaller and E. S. Larsen.

"Ordovician Outlier at Hyde Manor in Sudbury, Vermont," T. N. Dale.

"Preparation of Tellurous Acid and Copper Ammonium Tellurite," G. O. Oberhelman and P. E. Browning.

"Determination of Water of Crystallization in Sulphates," S. B. Kuzirian.

"Paleozoic Section in Northern Utah," G. B. Richardson.

The September issue of *Terrestrial Magnetism and Atmospheric Electricity* contains the following articles:

"Description of the C. I. W. Combined Magnetometer and Earth Inductor," J. A. Fleming and J. A. Widmer.

"Magnetic Declinations and Chart Corrections Obtained by the *Carnegie* from Port Stanley, Falkland Islands, to St. Helena and Bahia, February to April, 1913," L. A. Bauer and W. J. Peters.

"Magnetic Results of Halley's Expedition, 1698–1700," L. A. Bauer.

"Halley's Observations of the Magnetic Declination, 1698–1700," J. P. Ault and W. F. Wallis.

"On an Auroral Expedition to Bossekop, in the Spring of 1913," C. Störmer.

"Biographical Sketch of William Sutherland," E. F. J. Love.

"Results of Magnetic Observations Made by the United States Coast and Geodetic Survey at the Time of the Solar Eclipse of October 10, 1912," O. H. Tittmann.

Letters to Editor: "Principal Magnetic Storms